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Skating ponds illuminated by natural gas are among the possibilities of the future.

IRA REMSEN.

BALTIMORE, January 14, 1896.

'PROFESSORS' GARNER AND GATES.

THE daily papers state that Mr. Richard L. Garner, whose alleged investigation of the speech of monkeys has been so prominently advertised, is again expected in America. Accounts of the alleged investigations of Mr. Elmer Gates on the development of the brain are also being extensively reported. It is perhaps the duty of a scientific journal to state that neither of these gentlemen has as yet published scientific work deserving serious consideration.

J. MCK. C.

SCIENTIFIC LITERATURE.

The Psychology of Number and Its Applications to Methods of Teaching Arithmetic: By JAMES A.

McLELLAN, A.M., LL.D., and JOHN DEWEY, Ph.D. International Educational Series. D. Appleton & Co., New York.

This book makes a false analysis of the number concept, but advocates methods in teaching arithmetic which are in the main good. The conviction of its authors that the difficulties which children have with arithmetic are due to the neglect of teachers to lay sufficient stress on the metrical function of number has carried them to the extreme of maintaining that number is essentially metrical in its nature and origin. The conviction is well founded, inasmuch as the first serious difficulties of children are with fractions whose primitive function was unquestionably metrical and to which men in general attach no other than a metrical meaning; but there is no reason for drawing the conclusion that because the fraction, which is but a secondary concept of arithmetic, is metrical, its primary concept, the integer, is metrical also, or even that because a child can hardly be made to understand fractions without associating them with measurement, he requires the same help with integers. Nevertheless, the authors of this book maintain, in the most unqualified manner, that the integer is essentially metrical and should be taught accordingly. Thus they account as follows for the origin of number: Man found himself in a world in which the

supply of almost everything that he needed was limited. To obtain what he required, therefore, an economy of effort, a careful adjustment of means to an end, was necessary. But the process of adjusting means to an end is valuable in the degree in which it establishes an exact balance between them. "In the effort to attain such a balance, the vague quantitative ideas of smaller and greater * * * were transformed into the definite quantitative ideas of just so distant, so long * * *. This demands the introduction of the idea of number. Number is the definite measurement, the definite valuation of a quantity falling within a given limit."

They define counting, the fundamental numerical operation as but measuring with an undefined unit. "We are accustomed to distinguish counting from measuring. Nevertheless, all counting is measuring and all measuring counting. The difference is that in what is ordinarily termed counting, as distinct from measuring, we work with an undefined unit; it is vague measurement because our unit is unmeasured.

* * * If I count off four books, 'book,' the unit which serves as unit of measurement, is only a *qualitative*, not a *quantitative* unit."

And they formally define number as 'the repetition of a certain magnitude used as the unit of measurement to equal or express the comparative value of a magnitude of the same kind,' a definition which, so far as it goes, agrees, it is true, with that given by Newton in his *Arithmetica Universalis*, viz, 'the abstract ratio of any quantity to another quantity of the same kind taken as unit,' though Newton's purpose having been to formulate a working definition comprehensive enough to include the irrational number, it is anything but evident that this statement represents his analysis of the notion of number in the primary sense.

The immediate objection to all this is that it is much too artificial to be sound. And in fact it requires but a little reflection to be convinced that pure number is not metrical and that counting is not measuring, but something so much simpler that men must have counted long before they knew how to measure in any proper sense.

It is not enough to say that counting is the simplest mathematical operation; it is one of the simplest of intellectual acts. For to count a